SCIENCE NEWS

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CHEMICAL IDEAS IN MEDICINE AND BIOLOGY

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SEX, cancer, vitamins and virus diseases were linked together by Sir Henry Dale, director of Britain's National Institute for Medical Research, when at the dedication of the new research laboratores of Eli Lilly and Company he discussed striking relationships between substances once considered quite unconnected.

Investigators have discovered that the sunshine vitamin D, coal tar products causing skin cancer, and both the male and female sex hormones have a type of chemical structure which shows them to be in the same chemical family. In fact, Sir Henry explained, large doses of one of these substances will often act like one of the others, as when vitamin D is given in excess to female rats with the result that their sexual activity is quickened. Even more startling is the discovery that the coal tar substances causing tumors in chickens seem to set up a cancer disease that becomes an infection.

Dr. Peyton Rous, of the Rockefeller Institute for Medical Research, first found that this kind of cancer could be transmitted by injections of the fluid filtered from cancerous materials. Now it is found that cancer caused by a coal tar substance injected into muscles can be carried from chicken to chicken by the same method. This surprising fact seems to indicate that an infectious disease is created by a chemical substance acting in some way upon the living body.

Such experiments bring into connection the supposedly living ultra-germs or viruses and the powerful chemical substances known to be contained in the vitamins, hormones and other such admittedly non-living substances. What are these viruses? Sir Henry raised the question since they do not seem to be wholly chemical and it is difficult to imagine them as living organisms in the ordinary sense. The discovery of their exact nature is considered by Sir Henry as a great medical problem closely related to the secret of the cause of cancer. He predicted that useful medical developments in the future will come from continued research along these lines.

A chemical released in the nerves of the body every time a thought commands a nerve to move a muscle was also described by Sir Henry in a special paper. The message-carrying chemical is acetylcholine. Few people have ever heard of it. Yet it is the chemical that carries messages from nerves to muscles. This performance is suggested by several researches in past years but the reality of the effect is only now being recognized. The theory contends that almost infinitesimal amounts of this chemical are released whenever there is a thought that commands a nerve to order a muscle to move.

Hundreds of times a second extremely small spurts of acetylcholine are produced in the body of an active person, each one bridging a gap from nerve to muscle. It is hard to imagine the small amount of this chemical that is needed to act as chemical postman. Sir Henry computed that each outpouring spurt of acetylcholine consists of only three molecules. When he attempted to express its weight in grams, the scientific unit of weight that is one thirtieth of an ounce, he had to write twenty naughts to the right of a decimal point before a figure was reached.

If this chemical theory of how nerves control muscles really fits the facts, acetylcholine will be recognized as one of the most important substances in the living body, with great potential usefulness in medicine.

COSMIC RAYS AND THE OZONE LAYER

NEW studies of the stratosphere 12 to 20 miles above the surface of the earth are being made in Germany by Professor Erich Regener, of the Physical Institute at Stuttgart. Small free-flight balloons are used in the investigations. They carry aloft automatic instruments in the manner proposed in the new research program of Dr. Arthur H. Compton, of the University of Chicago.

Studies of cosmic ray intensities up to altitudes of 17.5 miles, Professor Regener reports to *Nature*, indicate cosmic rays have the same specific ionizing power over the whole region investigated from the surface of the earth up to the greatest heights studied.

Other balloons bearing a quartz spectrograph were sent up to altitudes of 13, 12.5 and 19.5 miles. An examination of sunlight at these heights disclosed that at 13 miles 40 per cent. of the protective layer of ozone in the earth's atmosphere was then below the instrument. At 19.5 miles 70 per cent. of the ozone was below the instrument.

Ozone is atomic instead of molecular oxygen. It has a characteristic odor noticed when a quartz arc is operating and occasionally after a lightning bolt strikes nearby. Because it strongly absorbs the ultra-violet rays of sunlight, ozone in the earth's atmosphere is often called a protective layer. Without ozone's presence sunlight would be so intense that plants, animals and people on the earth could not live on the earth in the manner they do now.

Studies of the height of the ozone in the atmosphere were performed in collaboration with Dr. Victor H. Regener. The cosmic ray studies were made with Dr. Georg Pfotzer.

Describing the results of the ozone studies, Professor Regener writes: "These results are remarkable because they confirm recent calculations predicting that the height of the ozone layer is much lower than previously supposed."

STUDIES OF ATOMIC COLLISIONS

AN improvement in the apparatus with which science takes photographs of atomic collisions in experiments on cosmic rays and artificial disintegration is announced in the current issue of *The Review of Scientific Instruments*. The improvement is expected to aid physicists in their study of the impact of cosmic rays on air atoms and in

the investigation of neutron bombardment in artificial radioactivity.

Professor L. M. Mott-Smith, of The Rice Institute, Houston, Texas, describes a new type of Wilson cloud chamber, the apparatus in which atomic collisions are studied. It is especially designed for operation at high pressures up to fifteen atmospheres, or about 225 pounds' pressure to the square inch.

In studying collisions occurring in this type of instrument it is only possible to sit by and wait for impacts to occur. At intervals they take photographs in the hope that at the instant of photographing a collision is occurring. It is a slow business for some of the rarer happenings in atomic collisions. Higher working pressure within the apparatus means that more gas atoms are present on which cosmic rays or neutrons may strike. The chance of obtaining the desired kind of pictures is thus increased manyfold with higher pressures.

The cloud chamber apparatus was the invention of Professor C. T. R. Wilson, of London, in 1912. So valuable has it been for research on the structure of the atom and its nucleus that he was awarded the Nobel Prize in 1927 for developing the technique.

Cloud chamber apparatus makes possible photographs of the tracks of the swiftest moving particles. As these particles rush through the gas of the chamber they knock electric charges off the atoms present in the path. By a movable piston arrangement water vapor is made to condense into little water droplets along the ionization path. Such drops show up white and can be photographed.

THE CASTING OF A REFLECTING LENS

THE world's largest block of glass—originally intended for the proposed 200-inch reflecting telescope of the California Institute of Technology—has now been completed. Officials of the Corning Glass Works have announced that the 20-ton piece of glass will be removed from the annealing ovens to make way for another twin glass disk.

Over half as wide as the average city lot and more than two feet thick, the great glass block, shaped like a slice of pineapple as it comes from the can, has served as a valuable "trial horse" for future work. Having learned by experience the problems incidental to the pouring and casting of such a large piece of glass, engineers of the glass works are now spurring work on a second disk the same size.

The present block of glass, it is claimed, would make a satisfactory telescope mirror, but a great amount of grinding would be necessary because of the unfortunate accident which occurred at the pouring last March. At that time ceramic material used to produce a honeycomb back on the disk floated to the surface and had to be removed. The present block, therefore, is solid glass throughout. It is simpler, declare the Corning scientists, to pour and cast a second disk.

It would have been extreme good fortune indeed if the first disk cast had been chosen for the 200-inch telescope mirror. Astronomers recall that when the French optical firm was casting the disk for the great 100-inch mirror of the Mount Wilson instrument, three castings were made. After tests the best one of these was chosen. It happened to be the first cast.

The pouring of the second 200-inch disk—17 feet across—should occur before the end of the year, it was announced by scientists of the Corning Glass Works.

THE HELIO-TECHNICAL INSTITUTE OF SAMARKALAND

SCIENTISTS and engineers of Soviet Russia are making experiments in which the heat energy of solar radiation may be turned into usable power on earth. In keeping with its program to duplicate the work of the western civilization in every form of technology Russia is now tackling the century-old problem of how to run steam engines by the energy streaming down from the sun.

At the Helio-Technical Institute of Samarkaland (Central Asia) a solar air heater is in operation. It dries vegetables and fruit in a few hours where older methods required days.

At Tashkent, also in Central Asia, in what used to be Turkestan, research for several years has been progressing on solar energy plants. A kitchen is being operated. Food is cooked, water boiled and water pumped up to a small water tank. So hopeful are Soviet engineers of solar energy that a power plant of 30,000 kilowatts' capacity is to be erected either on the shores of the Aral Sea or on the bank of one of its tributaries, the Amu-Daria River.

The latest design of pump to be used in this plant calls for movement of 4,000 cubic meters in 10 hours. Converting cubic meters into gallons of water yields the rather astonishing result of over a million gallons pumped in less than half a day. Likewise astounding is the amount of energy in sunlight. Each year the energy falling on the earth is 1,000 times as much as that obtainable from all the coal, oil and water-power used in the United States yearly if it were all available for power transformation.

But like all forms of energy conversion there is the question of efficiency in obtaining power from sunlight. One of the best methods, that of Willsie and Boyle in the early years of the present century, was not more than one or two per cent. efficient.

A GEOLOGICAL FORMATION IN WYOMING

WHAT the world looked like during the Devonian Age, which preceded the Age of Coal, may be partly reconstructed from an examination of a newly discovered geological formation at Beartooth Butte, Wyo. This formation, consisting of massive gray limestones and thin red shales, is rich with fossils of plants that grew on land and fish that swam the sea in those remote days. Together they constitute a "Lost World" picture beside which the product of the Wellsian imagination looks modern.

This place where land and sea life left their remains in the same ooze beds, to be changed later into rock, was apparently a wide river mouth, or estuary. The land plants grew as lush shore vegetation, and the water animals swam and scrambled near their roots.

Dr. Erling Dorf, of Princeton University, who ex-

plored the area, states that he has identified five fossil species of land plants, all of them ranking among the earliest forms of above-water vegetation. They belonged to an exceedingly primitive fern-like group, entirely extinct now, known to botanists as the psilophytales. The animal groups are represented by a total of 29 species, some totally extinct, some with still-living though markedly different modern relatives. The totally extinct groups include ostracoderms, which were armor-plated, fish-like animals now believed by some geologists to be the ancestors of fishes and through them of all other backboned animals. There is also a species of large eurypterid, or "sea scorpion." The eurypterids were great jointed animals, looking vaguely like lobsters, which attained five- or six-foot size. Finally, there are fossils of arthrodires, which were true fishes, cased in heavy plate armor.

Still-living groups are represented in the new formation principally by sharks. There are, however, fossils of a species of lungfish, which may possibly be evidence that the world then had wet and dry seasons as it has now; for the few surviving present-day lungfishes all live in regions where their ability to breathe air with their primitive bladder-like lungs enables them to retire into mud cocoons and survive fierce and almost waterless summer droughts.

Dr. Dorf will give full technical details of his study in the forthcoming issue of *The Journal of Geology*, published at the University of Chicago Press.

THE GULF STREAM

THE Gulf Stream does not originate in the Gulf of Mexico, two years of research by the Bingham Oceanographic Laboratory of Yale University have determined. Professor Albert E. Parr, scientific director of the Yale oceanographic expeditions, in charge of this work, now believes that the name "Gulf Stream" is a misnomer and should be changed.

The first known oceanographic survey of the Gulf of Mexico was made in the winter of 1932 by the Yale oceanographic expedition on the *Mabel Taylor*, with the cooperation of Drayton Cochran, of New York City. The many observations made during this survey have subsequently been analyzed in the Bingham Laboratory at Yale. According to Professor Parr, the work has progressed far enough to make it possible to say that the upper layers in the Gulf of Mexico are made of waters quite different from that of the upper layers of the Caribbean and also of the Gulf Stream.

Gulf of Mexico water seems to enter into relatively very little exchange with the waters of the surrounding seas and generally contributes little or nothing to the waters of the Gulf Stream, Professor Parr and his co-workers have found.

"The observations made," according to Professor Parr, "provide evidence to prove the theory already advanced by Danish investigators that the so-called Gulf Stream simply takes the shortest possible route from the Yucatan Channel to the Straits of Florida along the north coast of Cuba, carrying chiefly or exclusively waters brought directly from the Caribbean, with little or no contribution at all from the Gulf of Mexico.

"The popular name of the Gulf Stream is therefore certainly a misnomer, and should be replaced by a more suitable designation such as, for instance, the term 'Florida Current' which is now gaining wider usage among oceanographers and nautical people. Perhaps 'Caribbean Current' would really be the most fitting designation."

ITEMS

MIGHTY even in its overthrow, one of Yosemite's Big Trees, estimated to be nearly 2,000 years old, lies stretched along the ground in Mariposa Grove. The old sequoia, widely known as the Stable Tree because of a great burned-out place in its base in which horses were stabled in stage-coach days, was 269 feet high and 29½ feet in diameter at its base. The fall of the Stable Tree is attributed by park authorities to the great fire scar which had burned out its center more than two hundred years ago, greatly weakening its hold in the ground.

BEAUTIFUL and varied species of wild birds and animals of the Virgin Islands are to be given protection from destructive over-hunting, under plans now being worked out in the U. S. Department of the Interior. Although the islands are small, they still have fairly extensive game-harboring areas, where there are deer, white-crowned pigeons, herons, ducks, geese and other kinds of birds. Protection methods contemplated include the establishment of game sanctuaries on the mainland and bird refuges on the "cays" or little rocky coastal islands, the stopping of unfair hunting practises, and the spreading of the gospel of conservation among the people.

PLUTO, the planet which was discovered by Lowell Observatory astronomers in 1930 beyond the orbit of Neptune, is probably very similar in size to the moon, whose diameter is 2,160 miles. Dr. Walter Baade, of the Mount Wilson Observatory, Pasadena, Calif., has compared the brightness of Pluto with that of Triton, the satellite of Neptune. This moon is known to be about the same size as ours, and it appears even in the telescope as a point of light, like Pluto. He has found that Triton is about a fifth of a magnitude brighter than Pluto, a very slight difference, and therefore concludes that they are similar in size. Pluto's average brightness is of magnitude 15.41, and when it is most brilliant it is only 14.14, much too faint to be observed with any but the largest telescopes.

ELEPHANTS appear to be safe from extermination, at least for the present, in the Uganda Protectorate, the wild upland territory that lies in the heart of tropical Africa, north of Lake Victoria. The report of the game warden for that region indicates that these great animals are at least twice as numerous now as they were 25 years ago. Increases have also been noted in the hippopotamus herds, and the buffalo seem to be holding their own. Lions are numerous and in some instances aggressive. There are more gorillas in the Kayonsa Forest than had previously been estimated. It had been thought that the gorilla population had dwindled to not more than thirty animals; now there appear to be about eighty.